Champion of Innovation Award for Christopher Singer
Director of the Engineering Directorate (ED)
Marshall Space Flight Center (MSFC)

As Director of MSFC's Engineering Directorate, Chris works tirelessly with his team to increase innovation and encourage prudent risk taking. While Chris constantly reminds team members of the importance of delivering to our commitments, he is a perennial champion of more flexible and affordable engineering solutions. Marshall Engineering employees make up approximately half of the Center staff so Chris has the opportunity to influence almost every program and project at the Center. This has provided him a unique opportunity to inculcate innovation into everything MSFC Engineering touches. As a young engineer, Chris worked on Space Shuttle Main Engines. He often says that he learned as much from engine failures on the test stand as he learned from successes. He tells us to lean forward and be willing to accept some failures and asks us to convey the same message to everyone who works with us. He not only communicates with supervisors but also reaches out to mentor young engineers. He encourages his supervisors to provide opportunities for the next generation of engineers to do hands-on engineering and use new processes and tools.

Over the 30+ years of his NASA career, Chris has earned the respect of his technical peers and built relationships with a diverse group of employees, with industry leaders, and with partners in other government agencies. As an innovative leader, there are four key strategies that Chris has focused on in the last year.

- Increasing flexibility among and within engineering disciplines.
- Updating processes and procedures to encourage creativity rather than stifle it.
- Changing human spaceflight risk posture to be less conservative during development.
- Shortening the development cycle by promoting the use of innovative engineering tools and processes and an appropriate risk-taking culture.

Chris has changed the risk posture within Marshall's engineering workforce. In his internal discussions with supervisors and employees and in his presentations to external groups, he promotes the idea that failure is not only an option, but in some cases, it is a good thing, especially during development. He is an outspoken advocate of mentoring and infusing the next generation of leaders with the tools to inspire them to take the lead and innovate. During his leadership, he has helped shift our culture from an operational oversight mode (e.g., the Space Shuttle) to a development mode. Over the last year, Chris has implemented the tenet that to be affordable and sustainable, the risk posture of the engineering workforce must change during the design and development cycle. Chris encourages the team to use an evolved design process enabled by new technologies such as additive manufacturing that results in a higher fidelity development using prototype fabrication and early verification of producibility. This parallel process can reduce a complex development cycle by years.

This approach to risk has been particularly valuable in helping the Space Launch System (SLS) meet its deadlines and stay within budget. The Marshall engineering workforce is performing and delivering on the vehicle SLS Systems Engineering and Integration efforts. Chris advised teams that there is a time and place for everything and prudent risk taking is part of great engineering, especially during vehicle development when innovation can have the greatest impact on vehicle affordability and sustainability. He has built relationships with industry and with SLS program management that have helped this major NASA program lean forward. While change is not always popular, Chris' role as a respected leader and propulsion engineer, have helped him build an environment of appropriate risk taking. While Chris led the implementation of innovative changes by engineers supporting the SLS program, he also had the vision to champion other efforts. He realized that to enable long-term change in an organization, innovation must be implemented at all levels. He encouraged managers and chief engineers of technology projects to treat them differently than the way flight projects are handled. While the proper engineering rigor is warranted, he tells his teams that this is the time to push the envelope and find out how well these particular technologies actually perform. He has been a big champion of the game changing composite cryotank development and testing. In a presentation to AIAA on revolutionizing the design cycle, he discussed the need to smartly learn a tolerance for risk and failure in the quest to push boundaries, the need to willingly accept methods such as parametric analysis without extensive, expensive testing that impacts both budget and schedule, to harness the existing knowledge base and make continual improvements part of the culture, and to pursue high payoff, even disruptive, technologies. Chris emphasizes that there will always be a need to test especially when there is human life involved, but we need to do a better job of integrating our testing with our other tools.

He has championed the use of new tools and processes, such as unpiloted aerial vehicle systems, 3-D printing, strategies for a printable solid rocket, and structured light scanning.
The engineering organization has been provided with these tools and opportunities to perform hands-on work on projects like the Mighty Eagle Lander, the testing of engine components and life support system parts, and in many other efforts. This not only provides engineers with hands-on experience with real hardware, but it helps NASA become more sustainable by exploring how these technologies and processes can improve the way we do business.

There is tangible evidence that through Chris' leadership, his incorporation of innovative engineering practices and tools, and his drive for a new culture in which reasonable risk and failure are learning tools, MSFC Engineering is building a history of delivering on our commitments and creating better products faster, more nimbly, and more affordably than ever before.

This is why Chris Singer deserves the Champion of Innovation Award.